

Circles with Sulphuret of Potassium 259

theory meet, include, combine, and even predict, the numerous experimental results! When there is a current there is also chemical action; when the action ceases, the current stops (870, 873, 882); the action is determined either at the anode or the cathode, according to circumstances (1027, 1029), and the direction of the current is invariably associated with the direction in which the active chemical forces oblige the anions and cations to move in the circle (697, 1040).

864. Now when in conjunction with these circumstances it is considered, that the many arrangements without chemical action (813, etc.) produce no current; that those with chemical action almost always produce a current; that hundreds occur in which chemical action without contact produces a current (1005, etc.); and that as many with contact but without chemical action (855) are known and are inactive; how can we resist the conclusion, that the powers of the voltaic battery originate in the exertion of chemical force?

^f iii. *Active Circles excited by Solution of Sulphuret of Potassium*

865. In 1812 Davy gave an experiment to show, that of two different metals, copper and iron, that having the strongest attraction for oxygen was positive in oxidising solutions, and that having the strongest attraction for sulphur was positive in sulphuretting solutions.¹ In 1827 De la Rive quoted several such inversions of the states of two metals, produced by using different solutions, and reasoned from them, that the mere contact of the metals could not be the cause of their respective states, but that the chemical action of the liquid produced these states.²

866. In a former paper I quoted Sir Humphry Davy's experiment (678), and gave its result as a proof that the contact of the iron and copper could not originate the current produced; since when a dilute acid was used in place of the sulphuret, the current was reverse in direction, and yet the contact of the metals remained the same. M. Marianini³ adds, that copper will produce the same effect with tin, lead, and even zinc; and also that silver will

produce the same results as
copper. In the case of copper he
accounts for the effect by

¹ *Elements of Chemical Philosophy*, p. 148.

Annales de Chimie*, 1828, xxxvii. 231-237; **xxxix.
299.

³ *Memorie della Societd, Italiana in Modena*, 1837, xxi.
p. 224.